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VAAs as sources of volatility and fragmentation: self-selection effects and genuine effects

Jan Kleinnijenhuis[a], Jasper van de Pol[b], Anita van Hoof[a] and André Krouwel[a]

[a]Communication Science, Vrije Universiteit Amsterdam, Amsterdam, The Netherlands; [b]ASCoR, University of Amsterdam, Amsterdam, The Netherlands

ABSTRACT

Recent studies show that using Voting Advice Applications (VAAs) affects party preferences of voters, and hence leads to party switching. Party switching is a necessary but insufficient condition for volatility (a net switch of voters to other parties) and fragmentation (more parties gaining seats) at the aggregate level of electoral constituencies. The research question addressed here is whether the availability of VAAs in electoral constituencies weakens or strengthens trends towards greater volatility and fragmentation as observed in western democracies in the last decades. The data come from 380 Dutch municipalities during the 2014 Dutch municipal council elections. In 133 of them a VAA was available. Using a moderated mediation model that controls for the municipal self-selection of a VAA, we find that a VAA by itself leads to higher levels of volatility and fragmentation. However, VAA availability has a dampening effect in municipal constituencies with characteristics (e.g. population size, ethnic diversity, young average age) that would otherwise make them more susceptible and prone to volatility and fragmentation.

Introduction

Voting Advice Applications (VAAs) are the most commonly used political websites during election campaigns in many multiparty systems. They are popular both among voters, but also valued by political parties. Most political parties tend to support VAAs, especially if they fear that potential voters are not mobilized by their own social networks, or will be mobilized towards other parties by the mainstream media. For voters, VAAs are attractive for different reasons. Especially in multiparty systems with numerous political alternatives on offer, VAAs could diminish the information gap by helping voters to compare the positions of many political parties with regard to issues that play a role in the campaign, before making their final choice. Some voters use VAAs to

CONTACT André Krouwel andre.krouwel@vu.nl Communication Science, Vrije Universiteit De Boelelaan 1105, 1081 HV Amsterdam, The Netherlands

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check whether their preferred party indeed represents their issue positions, others because they may be in doubt between parties, or just because they search for the best party (van de Pol et al. 2014). VAAs could also be labeled as Voter Engagement Applications because they offer the promise to advance political knowledge, electoral literacy, voter engagement and democratic participation (Lees-Marshment et al. 2015; Van der Linden and Vowles 2016). Since in this paper we look at the implications of these applications on party switching, we stay with the more commonly used term VAA.

Starting from voters' motivations to use a VAA, one would expect an effect of obtaining VAA advice on party switching. With a few exceptions (Walgrave, Van Aelst, and Nuytemans 2008; Enyedi 2015) most studies found such an effect, regardless whether they were based on experiments, surveys among VAA users, or representative panel surveys including both users and non-users of VAAs (Kleinnijenhuis et al. 2007; Ladner, Fivaz, and Pianzola 2012; Marschall and Schultze 2012; Pianzola et al. 2012; Vassil 2012; Alvarez et al. 2014; Pianzola 2014a, 2014b; Wall, Krouwel, and Vitiello 2014). Some studies showed that VAA effects are partly but not fully endogenous. Prior party preference, for example, has not only a direct effect on the current vote, but also an indirect effect through the VAA advice obtained, since prior party preference is embedded in exposure to self-selected media content and in issue positions that in turn affect one's agreement with VAA statements that produce the obtained VAA advice (Kleinnijenhuis et al. 2007; Pianzola 2014a). Effects on party switching occur especially if the advice obtained is not fully endogenous but dissonant with prior political beliefs (Israel, Marschall, and Schultze 2016) provided that convincing levels of overlap continue to exist between these beliefs and the best ranked parties by a VAA (Alvarez et al. 2014). VAA effects on party switching most typically occur for younger voters with sufficient knowledge to make sense of the advice obtained, especially for those without strong predispositions to reject the advice given (Vassil 2012).

The current study takes party switching due to VAA use at the individual level for granted. Instead, we examine the effects of the availability of a VAA *at the aggregate level* in electoral constituencies on two output characteristics in each constituency: on volatility – defined as a net shift of seats to another party after elections (Pedersen 1979) – and fragmentation – defined as the effective number of equally strong parties (Laakso and Taagepera 1979). Increased levels of volatility and fragmentation have been identified as two major characteristics of western democracies in recent decades (WeBels et al. 2014). Several studies found electoral volatility (Chiaramonte and Emanuele 2015) and party fragmentation (Anckar 2000; Gabriel, Hoffmann-Martinot, and Savitch 2000; Dahlberg 2007; Bischoff 2013) to be associated with demographic and socio-economic variables.

Individual party switching is a necessary, yet insufficient condition for aggregate electoral volatility and party system fragmentation. Both

presuppose switching voters. As said, party switching is not a sufficient condition. If, for instance, all voters in a two-party system with two equally strong parties switch to the other party, then net volatility turns out to be zero. Party switching could result in fragmentation, but also in one dominant party. We do not know under which conditions VAA effects on party switching translate either into increased or into decreased volatility and fragmentation. The *research question* addressed here is whether VAAs contribute to volatility and fragmentation, or whether VAAs counteract developments and conditions that otherwise would have increased volatility and fragmentation.

We will develop a research model that allows for the possibility that VAA availability and usage increases volatility and fragmentation in electoral constituencies with specific demographic and socio-economic background characteristics, while they decrease volatility and fragmentation in electoral constituencies with opposite characteristics. The research model will have to take into account the endogeneity of VAA availability in an electoral constituency (see also Kreuzer 2016) since VAA availability may itself depend on the same demographic and socio-economic variables that favor or hamper volatility and fragmentation. Taking into account the endogeneity of VAA availability enables us to isolate VAA effects on volatility and fragmentation in spite of the spurious correlation due to common demographic and socio-economic origins of VAA availability on the one hand and volatility and fragmentation on the other.

The model will be applied in the context of the 2014 elections for 380 Dutch municipal councils. The Netherlands provides an excellent case to put the research model to the test. VAAs in the Netherlands were made available from the nineties onwards and from a comparative perspective, VAA use is high (Krouwel, Vitiello, and Wall 2014; Garzia and Marschall 2014). In national election campaigns almost half of the population uses a VAA. National elections from the 90s also showed higher levels of *electoral volatility* and an increasing number of parties in Parliament (Mair 2008; van der Meer et al. 2012; Dassonneville 2013), suggesting there might be a relation between VAA availability and increased volatility and fragmentation. The research question, however, requires a quasi-experimental research design with sufficient cases with and without the availability of a VAA, so as to isolate the genuine effect of endogenous VAA availability on volatility and fragmentation in spite of possible spurious correlations. Therefore, we turn to the 2014 elections for municipal councils. Municipality-tailored VAAs were made available during the 2014 Dutch municipal elections in 133 out of the 380 municipalities in which elections were held.

Why VAA advice may increase volatility and fragmentation

VAAs carry the potential to close the information gap that is felt by many voters (Kamoen et al. 2015). They aim at voter engagement in spite of a

complex political environment (Van der Linden and Vowles 2016). Especially in multiparty systems with numerous political alternatives on offer, they may help voters to comprehend whether issue positions of parties match their own preferences (Krouwel, Vitiello, and Wall 2014). This is even more relevant for choosing between parties that have relatively similar positions in the political landscape (Dassonneville and Dejaeghere 2014; van der Meer et al. 2015). VAA advice affects especially politically less-informed users with a lower level of education and knowledge (Kleinnijenhuis et al. 2007).

At the municipal level, voters may experience an even larger information gap. In second-order elections like the municipality elections there is less media attention than for national elections (De Vreese, Lauf, and Peter 2006) and the party system may differ from the national landscape. Additionally, interest of voters and electoral turnout are also lower (Hobolt & Wittrock 2011), so it is likely that at the municipal level, voters have less fixed party preferences and are generally less aware of the issues and the positions of the political parties. While major politically contentious national issues are extensively discussed in the media, at the local level the media landscape is often much weaker or even absent (Nielsen 2015). This means that politically relevant information included in the VAA about the parties competing for seats in the municipal council and their positions on specific issues, will be one of the few and scarce sources upon which voters can base their vote decision. The effect of VAAs on vote for the municipal council may, therefore, even be stronger than for the vote for the national parliament. We argue that VAA availability and usage as a consequence also may impact on volatility and fragmentation.

A first reason why VAA effects on party choice may accrue to *volatility* at the aggregate level is that VAAs neglect important voter considerations such as prior party choice, party identification, leadership evaluations, incumbency and assessments of political competence. VAAs, therefore, systematically put parties that strongly rely on those considerations at a disadvantage. VAAs also neglect party size, thus fail to cue strategic voting for major parties, which implies that VAA effects on party switching will also accrue to *fragmentation* at the level of electoral constituencies. Municipal VAAs typically include the issue positions of all parties that compete for seats in the municipal council; even those running for the first time and that do not have any seats. In fact, as VAAs at the municipal level are often developed in conjunction with all political parties running in the election, both large and small parties have equal agenda-setting opportunities. This equal playing field – where the smaller parties are treated equally to the larger parties – could also cause voters to switch allegiance or end up with a smaller or new party as the most proximate to their preferences. Empirical evidence shows that VAA use widens the choice set of VAA users and, as Kamoen et al. (2015) showed, voters who reported increased political knowledge

after having used a VAA were more likely to take the vote advice into consideration.

The second reason why party switching due to VAAs gives rise to volatility and fragmentation at the aggregate level is that each VAA design puts specific parties at an advantage to the detriment of others. Three aspects of VAA design matter most: issue selection, question wording and the decision rule. With regard to issue selection, Lefevere and Walgrave (2014) show with an experiment that parties benefit from a VAA that includes issues owned by them. Next, question wording and framing puts specific parties at an advantage. For example, parties that oppose free childcare (as this has regressive income effects) benefit from this question being framed as "households with dual incomes should pay for child care", rather than as "childcare should be freely available to everyone regardless of income" (Kleinnijenhuis et al. 2007). Thirdly, specific decision rules – alternatively labeled as decisional logics (Mendez 2016), or simply as algorithms (van der Linden and Dufresne 2016) – direct voters to specific parties (Kleinnijenhuis and Krouwel 2008; Louwerse and Rosema 2014; Mendez 2016), for example a low dimensional Euclidean decision rule as compared to a high-dimensional Manhattan city-block decision rule (van der Linden and Dufresne 2016). The consequence of these three aspects of VAA designs in short, is a certain level of arbitrariness in the advices VAAs provide to voters, which also may lead to fragmentation and volatility.

Both arguments lead to the conclusion that we do not expect simply random effects of VAAs on party choice, but systematic effects. This gives rise to hypothesis (H1) that *the availability of a VAA increases electoral volatility and fragmentation at the aggregate level of the constituency*.

Effects of municipal conditions on volatility and fragmentation

Obviously, VAAs are not the only source of volatility and fragmentation. Longitudinal comparative research at the national level in 18 countries shows an overall tendency towards increased volatility and fragmentation (WeBels et al. 2014, 5–8, 1846), also in party systems without a strong presence and usage of VAAs.

Both demographic and socio-economic variables are at the heart of volatility (Chiaramonte and Emanuele 2015) and party fragmentation (Anckar 2000; Gabriel, Hoffmann-Martinot, and Savitch 2000; Dahlberg 2007; Bischoff 2013) at the municipal level. In municipal elections, population size is a key determinant of the political trust of residents (Denters 2002, 1843) and on voter turnout. Larger municipalities show lower trust levels in political institutions and elites and lower political participation. Population size and urbanization are correlated with religious and ethnic diversity, but also with crime levels. Research in the United States (Putnam (2007, 1867) finds that ethnic

diversity undermines social and political trust. In Europe, lower levels of social and political trust are not caused by ethnic diversity itself, but by related variables like lower levels of trust in some minority groups, higher crime levels and economic deprivation (Tolsma, van der Meer, and Gesthuizen 2009; van der Meer and Tolsma 2014). Municipalities with larger ethnic diversity and minority groups, as well as weaker economic structures (more citizens with lower income, lower educational attainment and higher unemployment levels) also have lower electoral participation.

This leads to the hypothesis (H2) that the more urban and multicultural a municipality is, and the more deprived in socio-economic structures, the higher volatility and fragmentation will be.

Self-selection of VAAs by municipalities and VAA effects

In the 2014 Dutch municipal elections, city councils themselves, thus ultimately the incumbent political parties, decide to develop a municipality-tailored VAA. In Dutch local elections national political preferences dominate and media outlets primarily pay attention to national issues and parties' positions on these national issues (e.g. employment, immigration), rather than local issues and party stances. Nevertheless, Dutch municipal councils do decide on important issues with regard to health care, infrastructure, parking facilities, cultural institutions and local the economy. As many local parties compete in Dutch municipal elections alongside local branches of national political parties, voters need specific information on issues stances of these local parties. Almost one in three voters support a local party in municipal elections. In addition, not all parties represented in national parliament participate in each municipality. The anti-immigrant Party for Freedom (*Partij voor de Vrijheid*, PVV), for example, only fields candidates in two municipalities. This results in substantial differences of party systems at the local compared to the national level. This is one of the main reasons political parties at the local level believe that many voters may need a municipality-tailored VAA to make an informed vote decision.

As in previous election, VAA developers approached all city councils in 2014 offering to develop such a platform, which involves several meetings with all political parties in the municipality to determine the salient issues and the positions of the parties on these issues. This active co-production requires an explicit consent of all the parties participating in the municipal elections, which is often only taken after extensive inter-party discussions and presentations by multiple VAA developers. In these meetings, the results from studies about the effects of VAAs are extensively discussed, especially effects on knowledge and turnout of voters who would otherwise receive insufficient information on the issue positions of parties.

Local authorities and local media care about democratic legitimacy, informed citizenship and turnout at municipal elections. We expect that especially municipalities who have reason to fear that their inhabitants are insufficiently informed about local politics will choose to pay for a municipality-tailored VAA. Urban, multicultural municipalities and those with poorer and younger populations (e.g. students) may hope that making a municipality-tailored VAA available increases informed citizenship and ultimately participation. An additional reason why especially multicultural municipalities will employ a VAA is that especially urban municipalities with a large population size, and a corresponding large municipal budget, tend to be multicultural. A large municipal budget makes it easy to pay for a municipality-tailored VAA as costs are relatively low (approximately 10,000 euro) and regional media concern *Wegener* and Stemvan, a new VAA supplier, actually offered VAAs for free to many municipalities.

The third hypothesis (H3) is therefore that the same factors that cause volatility and fragmentation also make it more likely that a VAA will be made available. *Especially relatively urban and multicultural municipalities and municipalities with a relatively poor and young population are expected to offer a tailor made municipal VAA*.

VAA availability is a discrete novelty, although H3 predicts that VAA availability is in part endogenous because their availability is fostered by factors that also determine volatility and fragmentation directly. The next question is whether VAA availability may in turn diminish the latter effects of these factors.

The moderating effect of VAAs on factors that increase volatility and fragmentation

The hope of political parties competing for seats in the municipal councils that choose to employ a municipality-tailored VAA is that – most of all – voters will make a better-informed decision in casting their vote. Particularly municipalities with proportionally larger segments of young (i.e. students) and multicultural citizens will be inclined to employ a VAA because these inhabitants are expected to gain most in political knowledge as a result of their use of the VAA and subsequently turnout in the election. In such potentially highly fragmented constituencies, the availability of a VAA may actually diminish, dampen or moderate the effects of the social structures that would otherwise have increased volatility and fragmentation.

The fourth hypothesis (H4) is that *VAA availability diminishes/moderates the impact of demographic and socio-economic characteristics on volatility and fragmentation*.

Figure 1 visualizes these four hypotheses in a causal diagram.

From a methodological point of view, Figure 1 can be understood as a cybernetic policy model, which can be represented as a regression model

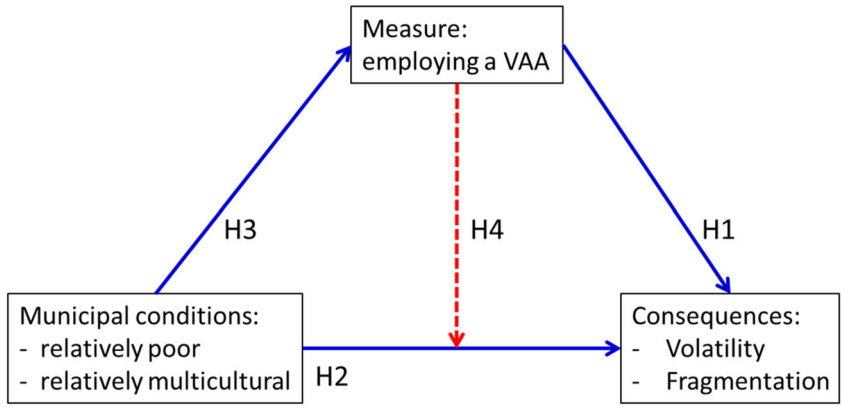

Figure 1. Conceptual model.

with interaction effects (Jaccard and Turrisi 2003), or more precisely as a mediated moderator model (Hayes 2013). VAA availability is represented in this cybernetic model as a mediator of the relationship between demographic and socio-economic conditions on the one hand and volatility and fragmentation on the other, but also as a moderator of this relationship. This model accounts for the endogeneity of VAA availability. Note that the endogeneity of political institutions – such as proportional representation – is usually modeled by considering such institutions merely as a mediator, rather than as both a mediator and a moderator (Kreuzer 2016). A cybernetic policy model predicts, for example, the break-even point between water damage and fire damage after sending the fire brigade to a more or less serious fire. The question in this article is whether employing a VAA by a local council sufficiently diminishes the effects of a less-informed, poor, young and multicultural citizenry on volatility and fragmentation, given the autonomous effects of a VAA on volatility and fragmentation. The model from Figure 1 can be used to predict the break-even point between volatility and fragmentation due to a VAA, and volatility and fragmentation to characteristics of a municipality's citizenry that motivated the deployment of a VAA in the election campaign.

Method

Data

Data on the use of VAAs in Dutch municipalities were obtained from the developers of Stemwijzer, Kieskompas, DeStemvan and from some spokespersons of newspaper publisher Wegener. It is possible that a very small number of municipal VAAs have been overlooked in this study. In one case, a

municipal VAA was not included because it appeared to be a subordinate part of a municipal website with lots of other activities. Data about structural characteristics of municipalities were obtained from the statline.cbs.nl website of Central Bureau for Statistics (CBS), the Dutch Office for Statistics. To assess how many parties entered the local council, data on municipal election results for each of the 931 nominal different parties that gained at least one seat in one municipality were obtained from the www.verkiezingsuitslagen.nl website of the Electoral Commission. The data set underlying this article is available from Data Archiving and Networked Services (DANS) (Kleinnijenhuis et al. 2016).

Measures

VAA availability. Data on VAA employment in municipalities were obtained from the two major national VAAs who delivered municipal VAAs on request of the local councils, Stemwijzer and Kieskompas, from a new developer StemVan/Nu.nl and from Wegener newspapers, who developed VAAs for many municipalities in regions where they publish regional newspapers. The percentage of VAA users per municipality could not be included since this number was not available for all VAAs. The number of available VAAs per municipality, of which the mean will be reported in Table 1, is a skew distributed variable. Instead of this skew variable, a dichotomous variable that represents whether in a given municipality one or more of the VAAs were available or not is assumed in the theory section, and used in Figures and model tests.

Turnout. Turnout per municipality was retrieved from statline.cbs.nl.

Volatility. Pedersen's volatility index (Pedersen 1979) was applied at the municipal level by computing, for parties that gained seats in the municipal election in 2014, the difference between their percentage of seats in 2014 and their percentage of seats after the previous municipal elections in 2010.

Table 1. Turnout, volatility and fragmentation split up by number of VAA's (mean and std.dev.).

	No VAA		One VAA		More VAA		ANOVA	
	M	SD	*M*	SD	*M*	SD	*F*(376,3)	
Turnout (%)	58.3	6.6	56.5	6.6	51.8	5.4	16.5	***
Volatility (%)	17.0	0.1	17.9	0.1	18.7	0.1	0.9	*ns*
Fragmentation (effective # parties)	5.6	1.3	6.8	1.7	8.1	1.3	61.5	***
N municipalities	247		97		36		380	

Note: *ns* no significant differences between three categories of municipalities.
***$p < .001$.

Fragmentation, was measured as the "effective number" of parties (in the same vein as (Laakso 1977), but based on the perplexity measure *P*, which is a transformation of the entropy measure *H* into entropy expressed in number equivalents: $P = 2^H = \prod_i (1/m_i)^{m_i}$ in which m_i is the proportion of the number of seats in the municipal council occupied by party *i*. In a municipality with two parties with an equal number of seats perplexity amounts to 2, but in a municipality with one big party and a very small party with one seat only, the perplexity would only amount to a number slightly greater than 1. The entropy-based measure is used here because it is relatively sensitive for the number, and the relative size, of relatively small parties that are routinely collapsed into "other parties" in brief accounts of party size (Laakso 1977).

Population Size. Population size in 2012 is available directly from statline.cbs.nl.

Ethnic diversity could be measured based on CBS data per municipality split up by country of origin, from which the size of the native Dutch population is easily calculated. Analogous to the calculation of party fragmentation, ethnic fragmentation is defined as the perplexity of different nationalities.

Crime. Crime registration in the Netherlands is messy and incomplete due to new registration systems at the level of police districts, in which data for several municipalities are combined. As a measure of municipal crime the number of deaths due to external death causes in 2005 and 2006 (statline.cbs.nl).

Average income. Average income was available for 2011 (statline.cbs.nl).

Age. To measure whether older or younger generations constitute the majority population in a municipality, those under the age of 20 are subtracted from the population of age younger than 65, and divided by total population size could still be used (statline.cbs.nl).

Dimensionality of municipal citizenries. A principal component analysis of structural municipal characteristics with varimax rotation shows two dimensions with an eigenvalue greater than 1 which together explain 74% of the variance in municipal characteristics: a cultural dimension focusing on population size, ethnic diversity and crime levels (factor loadings, respectively, 0.93, 0.82 and 0.93), and a socio-economic dimension focusing on average income levels and a youthful population (factor loadings 0.83 and 0.77). The poles of the cultural dimension are labeled as monocultural/rural and multicultural/urban, and the poles of the socio-economic dimension as poor/young and rich/old.

Data analysis

The conceptual model in Figure 1 with the "availability of a municipal VAA" as a mediated moderator does not give rise to a multi-normal distribution. The dichotomous nature of the mediated moderator, however, precludes

the use of improved estimation techniques offered by Hayes (2013, model 74). Instead we apply logistic regression analysis to test how municipal characteristics affect VAA availability (hypothesis H3) in combination with ordinary least squares regression analysis to estimate the main effects (H1 and H2) and their interaction effect (H4) on volatility and fragmentation. The supplementary materials provide an elaborated example of this mediated moderator model.

Results

In presenting our results we first provide descriptive evidence on the endogeneity of the availability of a VAA in a municipality. This shows to what extent municipalities that offered a VAA to their citizens during the campaign differ in terms of electoral volatility and fragmentation from those that did not offer a VAA. Next we turn to the location of municipalities on the cultural dimension and the socio-economic dimension. Thereafter, the two are combined by estimating the parameters of the research model (Figure 1) in order to ascertain the size of the moderating effect of a VAA on the effect of cultural and socio-economic municipal conditions on volatility and fragmentation as compared to the size of the direct effect of the employment of a VAA on volatility and fragmentation.

Turnout, volatility and fragmentation split up by VAA availability

Table 1 shows how average turnout, volatility and fragmentation differ between municipalities without voting assistance with one VAA and multiple VAAs. The *F*-ratio's based on a univariate Analysis of Variance signal whether the observed differences are statistically significant.

Clearly municipalities with a VAA, especially municipalities with more than one VAA, show a significantly lower turnout, and a significantly higher fragmentation. They appear to show also a higher volatility, but this difference is statistically insignificant. Our argument is that these differences do not exclude the possibility that VAAs may dampen the effects of socio-economic and demographic factors that otherwise would have resulted in even higher levels of volatility and fragmentation.

Endogeneity of VAA availability

The relationship between municipal VAA availability, turnout, volatility and fragmentation on the one hand and demographic and socio-economic municipal characteristics on the other, can be displayed in a co-ordinate system defined by a horizontal socio-economic poor–rich axis and a vertical cultural multicultural–monocultural axis (cf. Method section). Two diagonal axes are added: the poor and multicultural versus rich and monocultural

axis, and the rich and multicultural versus poor and monocultural axis. Municipalities are either located in one of the eight octants defined by the four axes, or in the centrist category – which was defined by a score of less than 0.5 standard deviation on each of the dimensions that define the eight octants. Only the most prototypical municipalities – those with the highest scores on one of the eight poles, and those with the lowest scores for the centrist category – are shown in Figure 2. Appendix (see supplementary materials) provides a full categorization of all municipalities. Figure 2 shows for example that the three largest cities of the Netherlands, The Hague, Amsterdam and Rotterdam, are the most prototypical examples of multicultural municipalities with average values on the socio-economic dimension. For each of the nine categories of municipalities, average VAA deployment, average volatility, average fragmentation and average turnout is displayed in Figure 2.

Figure 2. Average VAA employment, volatility, fragmentation and turnout as a function of a municipality's location on the cultural dimension and the socio-economic dimension.

Notes: vaa: percent municipalities who employed a VAA; turn: turnout percent at municipal elections; volat: volatility, percent of seats for different party compared to previous municipal elections; frag: fragmentation as measured by perplexity, which is the number of equally strong parties.

Figure 2 shows a clockwise pattern with regard to the deployment of VAAs, turnout, volatility and fragmentation. Clearly, the more multicultural the constituency, the more frequent a VAA is co-developed: in 95% of the multicultural municipalities a VAA was made available. This percentage is 68% in poor multicultural municipalities and still high for rich multicultural municipalities (58%). It is much lower for rich municipalities (20%) and lowest for monocultural municipalities (13%) as the hand of the VAA clock moves downward. This clockwise relationship shows the endogeneity of VAA availability. It offers a first indication of the plausibility of VAA self-selection (H3) and of the origin of volatility and fragmentation not only in VAA deployment (H1), but also in demographic and socio-economic characteristics of municipalities (H2).

Socio-economic and cultural factors as origins of volatility and fragmentation

The next question is whether Figure 2 also shows that the cultural dimension and the socio-economic dimension can be held accountable for fragmentation and volatility in line with hypothesis H2. If we look in the octants of Figure 2 at the numbers for volatility and next at those for fragmentation with these questions in mind, we see that – with regard to volatility – this is on average higher in multicultural municipalities (21%) than in monocultural municipalities (14%). Yet volatility is higher on average in the richer municipalities (20%) than in poor municipalities (14%). For volatility, the cultural dimension matters in the expected direction, but on the socio-economic dimension the relation seems to be in the opposite direction of what was expected.

For fragmentation both dimensions matter in the expected direction. On the average fragmentation is twice as high in multicultural municipalities (8.3 effective parties) than in monocultural municipalities (4.9 effective parties), and slightly higher in poor municipalities (6.1 effective parties) than in rich municipalities (5.9 effective parties). Also, in poor monocultural municipalities the effective number of parties is higher (5.4) than in rich monocultural municipalities (4.9 effective parties), while poor multicultural municipalities have more effective parties (7.7) than rich multicultural municipalities (7.2 effective parties). In short, Figure 2 shows a similar clockwise pattern in fragmentation as in VAA availability. All in all, our preliminary conclusion with regard to hypothesis H2 appears to be that especially the cultural dimension explains municipal variations in volatility and fragmentation.

Model tests

To unravel whether online VAAs have an additional effect on top of the cultural and the socio-economic dimension on the rise of volatility and

fragmentation, the research model in Figure 1 should be assessed at the level of municipalities ($n = 380$).

As could be expected already on the basis of our findings above, the socio-economic dimension has very little explanatory value for the rise or decline in volatility after VAA deployment by a local council, while the location of the municipality on the cultural dimension seems to have a higher impact. For volatility, we thus focus on the cultural dimension (Figure 3).

Within the cultural dimension, ethnic diversity is the most important predictor. With ethnic diversity as one independent variable, the structure of Figure 3 becomes identical to the conceptual model of Figure 1. It should be noted that it may not be ethnic diversity by itself that matters, as was suggested by Putnam (2007), but the lower levels of social and political trust within important minority groups (van der Meer and Tolsma 2014).

The mediated moderator model shows that the availability of a VAA in a municipality on average contributes $b = 0.13$, or 13% to the volatility level (on the 0–1 scale of volatility), which is in line with hypothesis H1. This means that in a municipality council of seven or eight seats, one seat will be allotted to another party after the election, simply due to the availability of a VAA for voters in that municipality. If the number of equally numerous settled ethnic groups in a municipality increases by one, volatility increases in line with hypothesis H2 on average by 11% ($a = 0.11$), but this effect is diminished if the municipality's voters are provided with a VAA ($c = -0.09$) in line with the moderation hypothesis H4. If a VAA is available (something that the coefficient d (=0.41) suggests is not unlikely in such circumstances), volatility increases on the average not by 11% but by 11–9 = 2%. In such a circumstance, the effects of ethnic fragmentation and VAA deployment seem to virtually balance each other out.

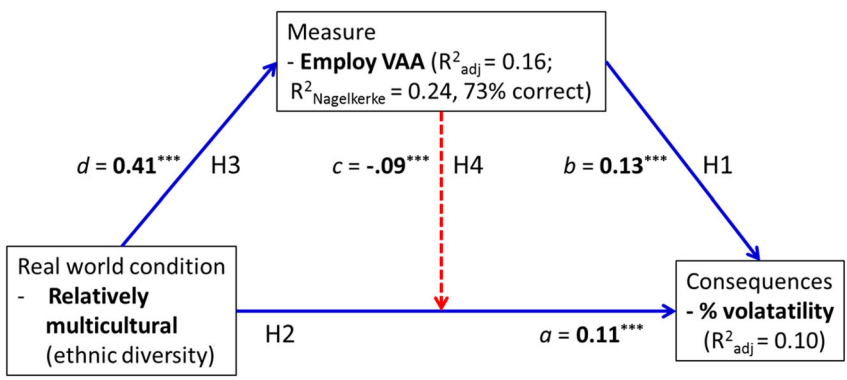

Figure 3. Estimates of autonomous and moderating effects of VAA advice on volatility.

Notes: ***p < .001, **p < .01, *p < .05, +p < .10, ns not significant (two sided). Numbers are unstandardized regression coefficients.

The mediated moderator model allows us to calculate a break-even point in ethnic diversity. The break-even point is located at the degree of ethnic diversity in which a municipality with a VAA becomes less volatile than a municipality without a VAA. The degree of ethnic diversity at the break-even point can be calculated as – (b/c) = 1.51. In 181 out of the 380 municipalities ethnic diversity exceeds 1.51 ethnic groups. If diminishing volatility would have been the only rationale to make a VAA available, then 181 municipalities should have made a VAA available. In 51% of these 181 municipalities a VAA was indeed made available. Only 20% of the municipalities below the break-even point of ethnic diversity used a VAA in the campaign. To put it differently, if volatility would have been the only decision criterion, then out of the category of municipalities with an ethnic diversity higher than 1.51, 51% of the municipalities who employed a VAA made a rational decision, as well as the 80% of the municipalities with a low volatility in which no VAA was made available. The supplementary materials provide further elaboration.

Figure 4 shows the estimates for a mediated moderator model to compare the direct effect and moderated effects of the deployment of a VAA on party fragmentation, with as antecedent variables both the cultural dimension as the socio-economic dimension.

The regression analysis shows that the availability of a VAA increases the number of equally strong parties in the city council on the average by b = 0.43 additional party. Would a typical municipality (score 0 on the cultural

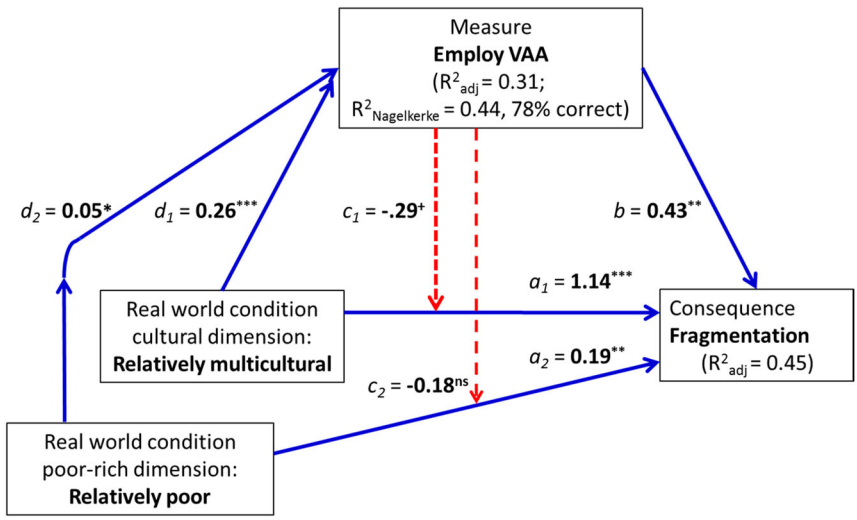

Figure 4. Estimates of autonomous and moderating effects of VAA advice on fragmentation.

Notes: ***p < .001, **p < .01, *p < .05, +p < .10, ns not significant (two sided). The numbers represent unstandardized regression coefficients.

dimension) change into a somewhat poor, somewhat multicultural municipality (with scores of +1 standard deviation on both dimensions), then the number of equally strong parties would increase on average by $a_1 + a_2 = 1.14 + 0.19 = 1.33$ additional parties. In case a modal municipality (with a score of 0 on the multicultural dimension) would join the extreme category of the 2.5% most multicultural municipalities, then on average a number of 2.66 additional parties would be expected to enter the municipal council. By deploying a VAA, the number of parties in a municipality in which 1.33 additional party was to be expected because of multiculturalism, the effect is moderated and the council will most likely only accrue $1.33 - c_1 - c_2 = 0.86$ additional party.

Because two antecedent dimensions play their role, the computation of a break-even line instead of a break-even point is appropriate. Along the cultural dimension the formula of this break-even line is $(-b - c_2$ Socioecnomic$)/c_1$. With, for example, a neutral score of 0 on the socio-economic dimension this formula reduces to a break-even point of $-b/c_1 = 1.47$, or roughly 1.5 standard deviation to the multicultural side. Thirty-one municipalities are more multicultural than this break-even point. Once more, the conclusion is that the mediated moderator model estimates show that deployment of a VAA in a local election enhances fragmentation, but diminishes the fragmentation that otherwise would have resulted from real-world conditions in poor and multicultural municipalities. In both cases the overall result of deploying a VAA is to impact positively the dependent variable, creating higher levels of volatility and fragmentation than would have been seen had no VAA been deployed. However, for highly multicultural municipalities these direct effects are largely offset by the VAAs' moderating effects on the effects that multiculturalism would otherwise have shown. In the case of fragmentation the same applies to municipalities that are relatively poor.

The current study focused on electoral volatility and fragmentation of municipal councils in a multiparty democracy. Other studies showed already the beneficial effects of VAAs for voter knowledge (Schultze 2014; Kamoen et al. 2015) and a higher turnout (Fivaz and Nadig 2010; Ladner and Pianzola 2010; Ladner, Fivaz, and Pianzola 2012; Marschall and Schultze 2012). When the mediated moderator model of this study is applied to turnout in Dutch municipalities, results show that VAA effects on turnout are also contingent on socio-economic and demographic factors. In municipalities in which the score of the citizenry on the multicultural dimension is one standard deviation above average, turnout will be lower on average by 4.5%, except when a VAA is employed, in which case turnout will be lower on average by 3.0% only. These additional results for turnout suggests that VAA deployment is helpful to enhance democratic citizenship and engagement, but usually cannot totally balance out the effects of increased volatility and party fragmentation due to demographic and socio-economic conditions.

Yet, in highly fragmented and poorer constituencies, VAA deployment does have a substantial dampening effect (see supplementary materials).

Discussion

The main question addressed here is whether the availability of a VAA, increases volatility and fragmentation, or whether VAA availability also diminishes volatility and fragmentation that otherwise would have resulted from demographic and socio-economic conditions. This question can be answered if we can compare a sufficiently large number of electoral constituencies that vary in terms of cultural and socio-economic conditions and in the deployment of a VAA. The Dutch municipal elections of March 2014 offered an ideal opportunity for such an investigation as 133 out of the 380 municipalities in which elections were held made a VAA available to voters. Demographic and socio-economic conditions in Dutch municipalities can be largely summarized in a cultural dimension consisting of population size (urban versus rural), ethnic diversity (multicultural versus monocultural) and crime levels, and in a socio-economic dimension consisting of wealth (poor versus rich inhabitants) and age (young versus old inhabitants). The citizenries of these 380 municipalities vary along both the cultural dimension and the socio-economic dimension.

Estimates of mediated moderator models (Hayes 2013) indicated indeed that VAAs do autonomously enhance volatility and fragmentation. At the same time they also counteract the effects on volatility and fragmentation caused by demographic and socio-economic conditions. To our knowledge this is the first study on VAA effects that shows that VAAs not simply enhance party switching and volatility, but that VAA deployments (Van der Linden and Vowles 2016) also have a dampening effect on volatility and fragmentation. If it can be assumed that municipalities want to prevent high levels of volatility and fragmentation, then break-even calculations indicates that in an overwhelming majority of the observed municipalities the decision that was made whether or not to make a VAA available turns out to have been rational. VAA deployments are overwhelmingly focused on municipalities where their presence does the most good in these terms.

One important limitation of the current study is that the actual use by voters of the various VAAs at the municipal level could not be taken into account due to a lack of data for some VAAs. Obviously VAA effects on electoral volatility and fragmentation will be smaller when fewer voters use such applications.[1] However, VAA use is widespread during Dutch elections.

Generalizations of our findings are not straightforward. VAA effects could be less important in municipal electoral systems with an elected mayor, as incumbency, competence and personality become relevant considerations for voters. VAA effects on fragmentation at the national level may actually

be smaller due to stronger voter attachments to parties and higher knowledge levels. The fragmentation effect of municipal VAAs result – at least partly – from the requirement of local councils that VAA developers include each and every political party entering the race on equal footing. At the national level, VAA developers usually exclude many small parties that are either not represented or will not gain seats according to opinion polls – or they leave the inclusion of minor parties to the VAA user. It is likely that in the Dutch multiparty systems with a very low electoral threshold of one seat, VAA effects on parliamentary fragmentation are larger than in multiparty systems with a higher electoral threshold or in majoritarian two-party systems.

An important finding is that, on average, VAAs cannot completely compensate for the cultural and socio-economic conditions that increased electoral volatility and fragmentation in western democracies in recent decades (WeBels et al. 2014), thereby affecting the legitimacy and stability of democratic government. Of course, we do not argue that all change and electoral turnover is bad or that new parties entering parliaments or councils cannot be a sign of a healthy and vibrant democracy. Indeed, one of the main functions of elections is "voting the rascals out". However, if VAAs by themselves contribute to electoral volatility and fragmentation, VAA developers need to be careful that the "direction" voters are sent by their advice do not put specific parties at an advantage to the detriment of others. Only then they can be truly Voter Engagement applications.

VAA designers can presumably do more to abandon or complement (elements of) decision rules in their VAAs that tend to increase volatility and fragmentation by highlighting and favoring small parties without a policy record to the detriment of party loyalty to more moderate established parties. In addition, more can be done to abandon unimportant and ambiguous issues that increase noise in VAA advice. Our results also show that VAAs do counterbalance volatility and fragmentation that result from structural demographic factors. This dampening effect is probably larger at the national level due to the exclusion (or less prominent positioning) of smaller parties in VAAs.

Next to this likely dampening effect, we should also weigh the positive effects on turnout, voter engagement and a better-informed citizenry as an effect of VAA use in our overall assessment of their utility. While the selection and framing of issues might be highly problematic, VAAs do force parties to take clearer stances on more issues and allow voters to easily compare a large number of parties on a wide range of issues. It is very important that VAAs are not seen by voters as simple shortcuts that save them needing to think about the complexity of an issue and the arguments behind all the positions adopted by parties and about the policy consequences once a party's ideas are implemented.

In turn, political parties and their candidates, as well as journalists and users of twitter, social media and the blogosphere should be made more aware of the need to highlight the substantive arguments in favor of against distinct issue positions, without being trapped in noisy, polarized or disrespectful debates that may only enhance volatility and fragmentation.

Note

1. To the extent that usage was low, expected effects would not be found. So our research design is conservative in these terms.

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No potential conflict of interest was reported by the authors.

Notes on contributors

Jan Kleinnijenhuis (Ph.D., Vrije Universiteit Amsterdam, 1990) is a professor of Communication Science at the Vrije Universiteit Amsterdam. His research in the subfield of political communication deals with the triangular dependencies between audiences, media and politics in bringing about news selection, news content, and news effects.

Dr J. van de Pol (Ph.D., University of Amsterdam, 2016) is a lecturer in Political Communication and Journalism at the University of Amsterdam. His research focuses on Voting Advice Applications, political internet use and public opinion.

Anita van Hoof (Ph.D., Radboud University Nijmegen, 2000) is an assistant professor in Communication Science at the Vrije Universiteit Amsterdam. Her research focuses on journalism and the impact of news on public opinion.

André Krouwel (Ph.D., Vrije Universiteit Amsterdam, 1999) is an associate professor of comparative political science and communication science at the Vrije Universiteit Amsterdam and founder of Election Compass (Kieskompas). His research focuses on elections, voting behaviour, political parties, party competition, populism and Euroscepticism.

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